

REMARKS

Claims 1-22 and 51-61 are pending in the application. Claims 51-61 have been allowed. Claims 3-10, 12, 15-19, 21 and 22 have been objected to for being dependent upon a rejected base claim, but would be allowable if rewritten in independent form.

With this Amendment, claims 4 and 52 have been canceled, claims 1, 7, 9, 51 and 53-55 have been amended and claims 62-67 have been added in order to further define the invention. No new matter has been added. Support for the amendments is set forth in the original application as filed.

Claim 1 has been rejected under 35 U.S.C. § 102(b) as being anticipated by Callegari et al. (U.S. Patent No. 6,020,946). Claims 2, 11 and 13 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Callegari et al. ('946) in view of Valentian (U.S. Patent No. 5,945,781). Claim 20 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Callegari in view of Sprokel (U.S. Patent No. 4,261,650).

It is respectfully submitted that the cited references, as well as the references submitted herewith in the Supplemental Information Disclosure Statement, cannot anticipate nor render obvious independent claims 1 and 51 and the claims dependent thereon.

Independent claims 1 and 51 claim three different alternative modes of alignment generally defined in sections a), b) and c).

In the first mode, a), the bombarded portion of the aligning substrate imparts to the defined liquid crystals an alignment direction having an azimuth angle ϕ of 0° and a zenithal angle θ of 0° to about 40° , as formerly defined in claim 4. The liquid crystal being thermotropic, such as a nematic liquid crystal having a negative dielectric anisotropy is described in at least Example 2.25, the cholesteric and ferroelectric liquid crystals are described in at least paragraphs [0030] and [0094], and the lyotropic liquid crystals are described in at least Examples 4.1, 4.2, paragraph [0030] and original claim 37, for example.

The second alignment mode defined in section b) of claims 1 and 51 indicate that the bombarded portion of the aligning substrate imparts to a liquid crystal an alignment direction having an azimuth angle ϕ of 70° to 110° and a zenithal angle θ of about 0° as disclosed in at least paragraph [0028], last two lines.

The third alignment mode defined in section c) of claims 1 and 51 is described in paragraph [0013] and at least Example 2.16, and uses combinations of the two basic modes of liquid crystal alignment that results in strong anchoring and moderate pre-tilt angle. As described in Example 2.16, after a first irradiation step, the substrate or source is rotated so that in a second irradiation step, the direction of plasma irradiation is perpendicular to the irradiation of the first irradiation step.

It is respectfully submitted that the Callegari reference cannot anticipate nor render obvious the invention set forth in independent claim 1. Callegari cannot anticipate the claimed limitation of directing a plasma beam from a closed drift thruster at an area of an aligning substrate to induce a surface anisotropy and the claimed alignment directions a), b) or c) as claimed in independent claim 1. Callegari teaches generating liquid crystal alignment utilizing an ion beam, see Col. 7, lines 7-36. It is not trivial for one of ordinary skill in the art to substitute the ion beam taught by Callegari with the claimed plasma beam from a plasma beam source. The alignment characteristics of liquid crystals are strongly dependent upon the properties of the particle beam. In the case of the claimed plasma beam processing based on a closed drift thruster, several modes of liquid crystal alignment are realized, namely a), b) and c) as claimed. Thus, utilizing a plasma beam instead of the ion beam in Callegari is not within the scope and content of the reference.

Regarding the combination of references cited by the Examiner, as mentioned hereinabove, Callegari uses an ion beam source as opposed to the plasma beam source claimed in independent claim 1. Further, Valentian teaches in Col. 4, lines 42-49 that the object of the invention is to remedy the drawbacks of known closed drift ion sources, and more particularly, to modify them to provide greater flexibility in use. When considering the scope and content of Valentian, namely to provide a closed drift ion source, it is unclear what a person of ordinary skill in the art would have known or could have done in order to arrive at Applicants' claimed process for preparing an aligning substrate including the step of bombarding at least one portion of the substrate with a plasma beam from a plasma beam source, thereby inducing a surface anisotropy and imparting alignment directions a), b) or c).

In view of the scope and content of the cited references, it is respectfully submitted that only impermissible hindsight can be utilized to replace the plasma beam source taught by Callegari with the closed drift ion source taught by Valentian.


The Sprokel reference does not disclose nor provide a scope and content that discloses the limitations of independent claim 1 regarding bombarding at least a portion of the substrate with a plasma beam from a plasma beam source to induce a surface anisotropy and producing an alignment direction on the bombarded portion of the aligning substrate bombarded by the plasma beam. The alignment process claimed in Sprokel is a deposition process, see Abstract of Sprokel. The claimed alignment process is not a deposition process and the processing parameters are different from those in Sprokel's procedure. Sprokel's source is based on "cold" plasma and the claimed plasma beam source generates a beam of accelerated plasma and operates at much lower pressures, lower in several orders of magnitude. Furthermore, it is generally difficult to compare distances for different processes, namely the processes of Sprokel based upon "cold" plasma streams and beams of accelerated plasma as used in the present invention.

It is respectfully submitted in view of the diverse teachings of the references that one of ordinary skill in the art would not be led to choose the method set forth in independent claim 1. The references disclose different sources, different parameters such as kind of particles, beam divergence, etc. These different factors would cause different alignment modes generated by beams from different sources and it is respectfully submitted that only hindsight motivation can be utilized to modify the references as indicated by the Examiner.

Should the Examiner have any questions or concerns regarding this response, a telephone call to the undersigned is greatly appreciated.

Respectfully submitted,

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